stomach of the sun-fish (*Orthagoriscus mola*), which Grassi believes to be a deep-sea species. In the Straits of Messina this fish rarely appears, except in the months from February to September, and the occurrence of *L. brevirostris* is limited to that period. The eggs, which evidently belong to Murænidæ, are found in the sea from August to January; the adult eels in an advanced stage of sexual development have been obtained from November to July; while, lastly, the migration of eels from fresh waters to the sea takes place from October to January. Thus Grassi traces backwards the succession of events in the origin and development of young eels, and reaches the conclusion that the elvers or eelfare which ascend rivers are already about a year old. The metamorphosis occupies one month. The eels which descend to the sea in winter take some months to ripen their sexual products. The eggs are fertilised in August and following months, and the larvæ are found in the following spring and summer. This agrees with the facts that have been established concerning the conger, the female of which takes about six months to develop her ovaries, and during this period takes no food. The eels which migrate to the sea in autumn have the generative organs in a quite immature condition, and, therefore, could not well be the parents of the elvers, which begin to ascend rivers in the following February. It would appear, however, from Grassi's paper, that he considers the metamorphosis to take place in winter, and that by one year old, he means derived from the larvæ of the previous summer; so that two years would elapse between the descent of the adult eels and the ascent of their progeny.

J. T. CUNNINGHAM.

NOTES

THE death of Prof. J. J. Sylvester, on Monday, deprives mathematical science of a most brilliant mind, and the scientific world in general of one of its foremost workers. The greatness of his genius has long been recognised wherever pure mathematics is studied; for his works command admiration by their originality and breadth of treatment. Eight years ago, Prof. Sylvester was added to the NATURE Series of "Scientific Worthies," and an account was then given of his career and of his more important contributions to mathematical science. We merely call attention to this article now, deferring until our next issue a fuller notice of the life and work of the esteemed investigator just lost to science.

M. G. BONNIER has been elected a member of the Section of Botany of the Paris Academy of Sciences, in succession to the late M. Trécul.

THE library of the late Prof. Kekulé, of Bonn, containing eighteen thousand volumes, mostly on chemistry, has been purchased by the firm of Messrs. Friedrich Bayer and Co., dye manufacturers, Elberfeld.

THE Russian Government has conferred the Order of St. Stanislas upon M. Moureaux, the director of the magnetic work at the Parc St. Maur Observatory. M. Moureaux has also been awarded a gold medal by the Geographical Society at St. Petersburg.

A "DISCUSSION" meeting of the Royal Society will be held on Thursday next, March 25. The subject for discussion is the chemical constitution of the stars, and it will be introduced by Mr. J. Norman Lockyer, C.B., F.R.S., with a communication "On the Chemistry of the Hottest Stars."

THE annual meeting of the Iron and Steel Institute will be held on Tuesday and Wednesday, May 11 and 12. At this meeting the Bessemer gold medal for 1897 will be presented to Sir Frederick A. Abel, Bart., K.C.B., F.R.S. The autumn meeting of the Institute will be held at Cardiff, August 10 to 13.

A REUTER telegram from Christiania states that the Financial Committee of the Norwegian Storthing has unanimously adopted a proposal in favour of granting 4000 kroner to each of Dr. Nansen's twelve companions, and 3000 kroner yearly during a period of five years to Captain Sverdrup, who will be at the head of the next expedition in the *Fram* planned by Dr. Nansen for 1898.

THE Howard Medal of the Royal Statistical Society, together with a cheque for 20*l.*, was presented to Dr. James Kerr, at the meeting of the Society on Tuesday, for his essay on "School Hygiene, in its Mental, Moral, and Physical Aspects."

THE Berlin Academy of Sciences offers a prize of 2000 m. for the best treatise on the origin and characters (*Entstehung u. Verhalten*) of the varieties of cereals during the past twenty years. The essays, which may be written in German, French, English, Italian, or Latin, must be sent in by December 31, 1898.

THE American Commission for the selection of a site for a Tropical Botanical Laboratory has now been constituted as follows:—Prof. D. H. Campbell (Leland Stanford University), Prof. J. M. Coulter (University of Chicago), Prof. W. G. Farlow (Harvard University), Prof. D. T. MacDougal (University of Minnesota).

CONSIDERABLE damage to gas and water pipes by electrolysis, due to the escape of the electric current used to propel trolley cars, is noted in Brooklyn. An illustration of the action of electricity was shown in a gas pipe two feet below the rail; the pipe having been found with a gap an inch wide in it, and the edges eaten down to the thickness of a sheet of paper.

PRESIDENT CLEVELAND celebrated the one hundred and sixty-fifth anniversary of the birth of George Washington on Monday, February 22, by setting apart thirteen forest reservations on the recommendation of Secretary Francis and a forestry commission of the National Academy of Sciences appointed by Prof. Wolcott Gibbs, President of the Academy. The reservations have an aggregate area of 21,379,840 acres.

THE Bertillon system of anthropometrical measurements is now applied to criminals in New York City.

THE veteran Italian botanist, Prof. T. Caruel, has retired from the professorship of Botany at the University of Florence.

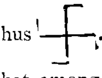
ON Thursday next, March 25, Prof. W. Boyd Dawkins, F.R.S., will begin a course of three lectures at the Royal Institution on "The Relation of Geology to History." The Friday evening discourse on March 26 will be delivered by Sir William Turner, F.R.S., his subject being "Early Man in Scotland."

WE regret to have to record the death of Prof. Henry Drummond, the author of "Natural Law in the Spiritual World," "The Ascent of Man," and other works aiming at the reconciliation of theological revelation with science and evolution. He travelled in many parts of the world, and his "Tropical Africa" contains a very readable account of his journeys in the interior of that continent. With Sir Archibald Geikie he went on a geological expedition to the Rocky Mountains, and he more recently visited Australia, Java, Japan, and China. He was only forty-six years of age at the time of his death.

THE Report of the Meteorological Council for the year 1895–96 has just been presented to Parliament, and is, as usual, divided into four sections. (1) Ocean meteorology.—The practice followed by the Office in the collection of information is to supply observers on ships with a complete set of instruments on condition of their return, with a log-book, on the completion of the voyage. The large steamship companies also allow access to their logs, and in some special cases the documents are deposited at the Office. The principal discussions in preparation for publication during the year in question were current charts of the Arctic regions, embracing the area lying north of 60° north latitude, and the meteorology of the South Sea, embracing the area from the Cape of Good Hope to New Zealand. The latter charts, which are the first published for that part of the ocean, will be found very useful by the navigator, especially in connection with the question of the westward homeward route from Australia. Under this head is also included the supply of instruments to distant stations; several sets have been supplied, at the cost of the Foreign Office, for use in Uganda. (2) Weather telegraphy and forecasts.—The work in this branch is constantly increasing from inquiries by the public as to current and past weather, which necessitate a considerable amount of investigation. The number of stations to which storm-warning telegrams are sent has been materially increased during the year by the addition of a number of lighthouses, in accordance with a suggestion made by the Royal Commission on Electrical Communication with Lighthouses. The Council renewed the offer, made in previous years, of sending daily forecasts to agriculturists during hay-making; the results show that the total percentage of useful forecasts amounted to 89 per cent., the same as in the preceding year. (3) Climatology.—This branch includes the discussion and publication of all observations relating to the climate of the British Isles. The publication of the monthly and yearly results for a number of stations for the fifteen years (1876-90) appeared during the year, and forms a valuable contribution to climatological knowledge. (4) Miscellaneous experiments and researches.—The comparison of various forms of anemometers has been made, with the object of determining the factor for converting the records of various instruments to the true velocity of the wind. Experiments have also been made for the measurement of earth temperatures at considerable depths. Rainfall means for a large number of stations are in an advanced state of preparation, and when completed will form a standard of reference in this important subject.

Since Jühler and Jörgensen, now nearly two years ago, revived the idea of moulds being the parent of yeast cells, a considerable amount of attention has been directed to the careful reinvestigation of this question. Amongst those who have submitted Jühler and Jörgensen's results to the several tests of experimental inquiry, must be reckoned Messrs. Klöcker and Schiöuning, and in the last number of the *Compte-rendu des travaux du Laboratoire de Carlsberg* these gentlemen publish an extremely interesting memoir entitled "Que savons nous de l'origine des Saccharomyces?" An historical survey of the subject prefaces their own extensive investigations, and we are carried back to the days when Pasteur himself was under the impression that the mould Dematium, so abundantly present on vines, might furnish forth yeast cells, an idea which his later experiments led him, however, to discard. If this Dematium, as Jörgensen claims, is a parent of yeast cells found on grapes, then, provided this mould is present, yeast cells are bound to appear on the surface of the fruit. Klöcker and Schiöuning, following in the earlier footsteps of Chamberland and Pasteur, protected grapes from aërial contamination by enclosing them in glass vessels plugged with cotton wool whilst still attached to the vine. The time selected for their imprisonment was the green stage of the fruit when, whereas Dematium is present in abundance, no yeast cells are to be found. Comparative examinations made later of protected and unprotected grapes respectively, revealed the fact that, whilst the former exhibited plenty of Dematium and not a single yeast cell, the latter, along with the mould, had an abundant crop of yeast cells. The conditions of the two sets of grapes were identical, barring the air being deprived of germs in the one case before reaching the fruit, and not in the other. The experiment was varied in divers interesting ways, but in no single instance was any evidence forthcoming that the yeast cells obtained access to the fruit otherwise than from the surrounding air, the mould Dematium being proved absolutely innocent of any participation in their presence.

Mr. P. Lee Phillips speaks truly where he says, in a paper entitled "Virginia Cartography," just issued as No. 1039 of the Smithsonian Miscellaneous Collections, that no records of the past have suffered more from the wear and tear of time than maps. On this account the preparation of a bibliographical description of maps of Virginia—a portion of North America which in early days embraced much of that which is now known as the United States—must have been a very laborious task, and Mr. Lee Phillips is to be congratulated upon having brought his work to a successful conclusion. The maps comprised in his monograph range in date from 1585 to 1893.

We have on our table several very valuable excerpts from the Report of the U.S. National Museum for 1894, but the limitations of space prevent us from doing more at the present time than call attention to their publication by the Smithsonian Institution. In one of these excerpts Mr. Thomas Wilson describes, and lavishly illustrates, "The Swastika" and its migrations; and makes some observations on the migrations of certain industries in prehistoric times. The Swastika is the earliest known symbol, and consists of a monogrammatic sign of four branches, of which the ends are bent at right-angles, thus . Prof. Max Müller has found evidence for believing that among the Aryan nations the Swastika may have been an old emblem of the sun; but he has also shown that in other parts of the world the same, or a similar emblem, was used to indicate the earth. Mr. Wilson does not attempt to discuss the primitive meaning of the sign, or the place of origin, because they are considered to be lost in antiquity. The principal object of his paper is to present in a compact form all the information obtainable concerning the Swastika, and to trace its possible migrations in prehistoric times. Another of the papers from the U.S. National Museum is on "Primitive Travel and Transportation," by Dr. O. T. Mason. As is the case with all the publications of the Museum, this is illustrated with numerous plates and figures in the text. We must content ourselves now with noting the statement that the mechanical powers, as they are called, seem to have come into vogue in the following order: (1) The weight, for hammers, traps, and pressure; (2) the elastic spring, in bows, traps, machines; (3) inclined and declined plane, in locomotion and transportation; (4) the lever; (5) the wedge, in riving and tightening; (6) the sled, on snow or prepared tracks; (7) the roller, for loads and in machine bearings; (8) the wheel, in travel and carriage; (9) wheel and axle in many forms; (10) pulleys, with or without sheaves; (11) twisting, shrinking, and clamping devices; (12) the screw. The subjects and authors of three other publications just received from the U.S. National Museum are: "A Study of the Primitive Methods of Drilling," by Mr. J. D. McGuire; "Mancala, the National Game of Africa," by Mr. Stewart Culin; and "The Golden Patera of Rennes," by Mr. Thomas Wilson.

The very important question of the physical and chemical nature of the pigment substances found within the scales of

Lepidoptera, form the subject of a paper, by Mr. A. G. Mayer, in the March number of the *Entomologist*. Experiments have shown that reds, yellows, browns and blacks are always due to pigments. In some cases, greens, blues, violets, purples and whites are also due to pigments, and not, as is usually the case, to structural conditions, such as striæ upon the scales, &c. Concerning the chemical nature of the pigment substances within the scales, little has as yet been made known. The white pigments in the Pieridæ appear to be due to uric acid, and the red and yellow pigments to two closely related derivatives of uric acid. The green pigment found in several species of butterflies and moths has also been shown to consist of a derivative of uric acid. The results of a careful investigation leads Mr. Mayer to believe that the colours of many of the Lepidopteral imagos are derived from the hæmolymph or blood of the chrysalis. It is well known that the most universal colours of the more lowly organised moths are the drab-grey and yellow-drab tints, and these are the colours which Mr. Mayer found were assumed by the hæmolymph after exposure to the air. The brilliant yellows, reds, &c., are the result of more complex chemical processes; but the colours can be manufactured to some extent by treating the hæmolymph with certain reagents. In connection with the phenomena of pigmentation it is noted that uric acid is never present in the hæmolymph of the imago of Saturnidæ, nor could Mr. Mayer detect it in the drab-coloured pigment of the outer edges of the wings.

Attention may here profitably be directed to a paper which, though at first sight may appear of purely medical interest, has an important bearing upon the results described in the preceding paragraph. We refer to a brochure by Mr. J. Barker Smith, reprinted from the *Medical Press and Circular*, 1896-97 (Baillière, Tindall, and Cox). Mr. Smith's experiments suggest that urates may be excreted by the hair, and that uric acid plays a *rôle* in respiration and in the formation of the red corpuscles from nuclear elements. The discovery of urates in the hair is significant, for it naturally brings into consideration wool, feathers, fur, &c., as to colouration and use, and also adornment and odour with reference to excretion and sex. Should Mr. Smith's results be verified, they indicate that one chemical of necessity determines many common characteristics in a large section of our fauna. Another noteworthy point in the paper is the description of a new and rapid method of estimating urates.

Baron H. Eggers contributes a paper on the Gulf of Maracaybo to the *Deutsche Geographische Blätter*, referring specially to the asphalt springs of El Menito. The whole region is of great geographical interest, but is little known on account of its extremely unhealthy climate. El Menito itself is a rounded knoll about 1 km. in diameter, and dotted about on its surface is a number of small cones, from which streams a mixture of mud, water and asphalt. The asphalt is in general colder than the surrounding air, and hardens in a few days, usually in a much cleaner and purer condition than the familiar asphalt of Trinidad. The greatest output of asphalt from this region took place in 1885, when it amounted to 161,000 kilogs., but since then the quantity has steadily diminished, chiefly from political causes.

Many and various are the lakes in the United States, but there is only one which occupies the crater of an extinct volcano; it is the Crater lake of Southern Oregon, lying in the very heart of the Cascade range, and belonging to the great volcanic field of the north-west. A very instructive illustrated account of the features of this lake is contributed to the *National Geographic Magazine* by Mr. J. S. Diller, of the U.S. Geological Survey. The lake contains no fish, but a small crustacean flourishes in its waters, and salamanders occur in abundance locally along the shore. According to observations made by Mr. B. W. Evermann last summer, the temperature of the water decreases from a depth of 555 feet to the bottom (1623 feet). The results suggest that the bottom may still be warm from volcanic heat, but more observations are needed to fully establish such an abnormal condition. Mr. Diller shows that Crater lake not only presents very attractive scenic features, but also affords a most instructive and interesting field for the study of volcanic geology.

Mr. Scourfield's plea for a fresh-water biological station in England is supported by Prof. Dr. Anton Fritsch, who, in a short article in *Natural Science* (March), shows that valuable work is being done on the fauna and flora of fresh water in Bohemia and Germany. Prof. Fritsch hopes that England will soon likewise do her duty to fresh-water biology, by establishing a station where investigations can be carried on. Such an institution would give results of a practical, as well as scientific value. In connection with this subject, and in evidence of the valuable work accomplished at the Biological Station of the University of Illinois, situated at Havana, on the Illinois River attention may be directed to a bulletin just received. By this publication Mr. Richard W. Sharpe makes a noteworthy "Contribution to a Knowledge of the North-American Fresh-water Ostracoda included in the families Cytheridæ and Cyprinidæ."

No better evidence could be adduced of the valuable services rendered to science by the establishment of a national physical laboratory, than the following list of investigations published within the last few months in *Wiedemann's Annalen*, all emanating from Charlottenburg:—Herr K. Kohle describes Helmholtz's absolute electrodynamometer as constructed during the lifetime of Helmholtz at the Reichsanstalt, and which he has employed to determine the electromotive force of Clark's cell; Herr Willy Wien contributes a mathematical investigation of the formulæ required to determine the constants of the instrument; Herrn W. Jäger and R. Wachsmuth describe a series of experiments on the cadmium cell, including a comparison of its electromotive force with that of Clark's cell, and a determination of the variations of this element with the temperature; Dr. L. Holborn and Herr W. Wien describe some important researches on measurement of low temperatures, including a comparison of the air and hydrogen thermometers; and Herrn M. Thiesen, K. Scheel and H. Diesselhorst give an account of a series of determinations of the coefficient of expansion of water.

As the result of work carried on in the same laboratory, Prof. Friedrich Kohlrausch, of Berlin, contributes to the *Annalen* papers on the following subjects:—On platinum electrodes and determinations of resistance; on the plugs of rheostats; on very rapid fluctuations of terrestrial magnetism; and on a thermometer for low temperatures, and a determination of the coefficient of expansion of petroleum-æther. The latter name is applied to a certain mixture of hydrocarbons whose boiling point is 33°, and specific gravity 0·6515 at 17°. This substance remains fluid down to the temperature of liquid air, when it becomes highly viscous.

In the *Zeitschrift des Vereines deutscher Ingenieure*, Dr. L. Holborn gives an account of Le Chatelier's thermo-electric element, and shows how it may be applied to the continuous measurement of the temperature of a furnace, thus possessing considerable advantages over the pyrometers in common use. Writing in the *Berliner Sitzungsberichte*, the same physicist describes a number of observations on the coefficient of magnetisation of different kinds of iron and steel, showing that in a feeble field of force the coefficient in question is a linear function of the temperature. The experiments connected with both of Dr. Holborn's present papers, like those of the two preceding articles, were carried out at Charlottenburg.

The hostility often shown by farmers to the work of the Technical Instruction Committees of the County Councils may, perhaps, be tempered a little by an examination of a report on manurial trials, conducted by Prof. W. Somerville, during the season 1896, under the auspices of the County Councils of Cumberland, Durham, and Northumberland, and the Durham College of Science. The experimental work furnishes agriculturists in the North of England with very valuable information upon the effect of different manures and mixtures of manures upon crops. It has been proved that though increasing quantities of farmyard, or of artificial, manure will produce increasing yields up to a certain point, the profits per cwt. are greater for a moderate than for a large dressing. The addition of artificial manures to a fair dressing of farmyard manure appears to have exceedingly little, if any, effect upon the crop. This and other results show that there is need for manurial reform in the matter of the combined use of natural and artificial manure. Prof. Somerville has again demonstrated by experiment the extremely infectious character of the "finger and toe" disease; and, as already noted, his experiments with "nitragin" have failed to give positive results; so it is doubted whether the new substance, in its present state, will prove of any service to agriculture.

A quantitative study of correlated variation and of the comparative variability of the sexes has been made by C. B. Davenport and C. Bullard, by counting the Müllerian glands in the fore-legs of four thousand swine. The total number of glands on a single leg varies from 0 to 10; and the counting has shown that they are slightly less abundant in the female than in the male. The average numbers of the glands on the right leg and on the left leg, taken without regard to sex, are about equal. As to their variability, it appears that the variants are distributed in accordance with the probability curve, or very nearly so. The degree of variability in the right and left legs is, especially in the case of the male, strikingly similar, being 1·41089 and 1·41083 in the two cases respectively, the difference being within the errors of the method. The males are about 2·5 per cent. more variable than the females. The degree of correlation in the variability of the right and left legs is about ·777. The observations are described in the *Proceedings* of the American Academy of Arts and Sciences (vol. xxxii. No. 4, December 1896).

The April number of *Science Progress* will contain articles on the "Physiology of Reproduction," by Prof. H. Marshall Ward, F.R.S.; on "Condensation and Critical Phenomena," by Prof. J. P. Kuenen; on "Diseases of the Sugar-cane," by Mr. C. A. Barber, late Superintendent of Agriculture in the Leeward Islands; and on "Coagulation of the Blood," by Dr. Halliburton, F.R.S.

The volume containing the "Results of Rain, River, and Evaporation Observations made in New South Wales" during 1895, under the direction of Mr. H. C. Russell, C.M.G., F.R.S., has just been published. In addition to the usual statistics, the volume contains Mr. Russell's paper on the "Periodicity of Good and Bad Seasons," already abridged in Nature (vol. liv. p. 379), and also some instructive diagrams showing the relative values of the rainfall of the Colony for the past six years.

A new "Encyclopædic Dictionary of the English and German Languages," edited by Prof. Ed. Muret and Prof. Daniel Sanders, is in course of publication, in parts, by the Langenscheidtsche Verlagsbuchhandlung, Berlin. The work is being issued in two sections—English-German and German-English—and will be completed in about forty-eight parts. The last part of the former section will appear in a few months; the first part of the German-English section has, however, only just been issued. Judging from this part, the Muret-Sanders "Wörterbuch" will, when completed, possess advantages over all existing German dictionaries. The London agents are Messrs. H. Grevel and Co.

Messrs. William Wesley and Son have, since 1871, issued a number of excellent catalogues of scientific works, but they have not compiled a better catalogue than the one just published as Nos. 127 and 128 of their "Natural History and Scientific Book Circular." In the ninety-two pages of this list are the titles of more than three thousand works on every subject connected with botanical science, both in its theoretical and applied branches. The works are classified into about fifty groups, and are arranged alphabetically, according to authors, in each group. Great attention appears to have been paid to careful description and correct classification, and we have no doubt that the catalogue will be of real use both to botanists and gardeners.

New editions of two standard German scientific works have been received. One is Naumann's "Elemente der Mineralogie" (Leipzig: Wilhelm Engelmann), the thirteenth edition of which has been revised and enlarged by Prof. Dr. Ferdinand Zirkel. Only the first half of this new edition has as yet been published; the second half will appear towards the end of this year.—Kirchhoff's "Vorlesungen über mathematische Physik" (Leipzig: B. G. Teubner) has reached a fourth edition. The first volume, on mechanics, has appeared under the editorship of Prof. Dr. W. Wien. The original work was published twenty years ago, and the two following editions of it—the third in 1883—were seen through the press by the author himself. The present edition of Kirchhoff's "Mechanik" is thus the first which has been issued under the guidance of another.

Herr A. Sonnewald, veterinary surgeon, contributes a paper of considerable interest to the current issue of *Deutsche Geographische Blätter*, summarising present knowledge of animal epidemics in South Africa, and describing in particular the geographical distribution of the rinderpest. The paper refers specially to the work of Edington and Thompson.

A point which strikes one on glancing through the annual report of Mr. Frederick J. V. Skiff, the Director of the Field Columbian Museum, is that a large number of expeditions are sent out by the Museum to collect specimens and make observations. The most important expedition of the year was one which went to Africa, under the direction of Mr. D. G. Elliot, Curator of the Department of Zoology, except ornithology. This party arrived at Aden last September with a splendid collection. Mr. C. F. Millspaugh, Curator of the Department of Botany, began his work last year on the forestry of the Mississippi Valley. The Curator of Geology went on expedition to the Republic of Mexico. He made a complete ascent of Popocatepetl and explored the crater, and ascended Ixtaccihuatl far enough to permit a study of its glacier. A great many mineral specimens and ores were obtained. Mr. G. K. Cherrie, Assistant Curator of Ornithology, spent three months collecting bird skins along the Gulf coast between New Orleans and Corpus Christi, Texas. Nearly one thousand skins were thus added to the North American division of this department. Mr. Miner W. Bruce arrived from Alaska after nearly two years absence, with a collection of 1200 or more specimens illustrating the arts and industries of the Eskimo of Alaska. He has returned again to the North with a commission to add further material, and to extend his work into Siberia. Mr. E. H. Thompson made a report on the recently examined ruins of Xkichmook, accompanied by specimens and photographs. Vice-President Ryerson and Mr. C. L. Hutchinson, on their trip around the world, procured and presented to the Museum a large and unique amount of material, including Etruscan and Stone Age remains from Italy, Roman terra-cottas, metal and stone work from the Indies, and butterflies from the Himalayas. Mr. Owen F. Aldis invited Mr. O. P. Hay, Assistant Curator of Ichthyology, to accompany him on an excursion to the waters of Southern Florida. Nearly one hundred fine specimens were thus obtained. By sending collectors to all parts of the world in this way, the Field Columbian Museum gives evidence of very great activity. The specimens obtained by its officers will not only serve to enrich the Museum directly, but a large number of them can do so indirectly by exchange.

THE additions to the Zoological Society's Gardens during the past week include two Secretary Vultures (*Serpentarius reptivorus*) from South Africa, presented by Mr. P. Myburgh; two Sacred Ibises (*Ibis æthiopicus*) from South Africa, presented by Mr. Almeda; a Herring Gull (*Larus argentatus*), a Lesser Black-backed Gull (*Larus fuscus*) from Nova Zemlya, presented by Mr. C. L. Rothera; a Rose-crested Cockatoo (*Cacatua moluccensis*) from Moluccas, presented by Mrs. Anderson; two Crested Porcupines (*Hystorix cristata*), a Griffon Vulture (*Gyps fulvus*) from North Africa, presented by Mr. R. S. Hunter; four Common Rat-Kangaroos (*Potorous tridactylus*, 2 ♂, 2 ♀), seventeen Lesueur's Water Lizards (*Physignathus lesueuri*) from Australia, deposited; two —— Parrakeets (*Psephotus chrysopterygius*) from Australia, four Brent Geese (*Bernicla brenta*, 2 ♂, 2 ♀), European; a Bengalese Cat (*Felis bengalensis*) from the East Indies; four Red-crested Pochards (*Fuligula rufina*, 2 ♂, 2 ♀) from India, three Mandarin Ducks (*Æx galericulata*, ♀) from China; three Summer Ducks (*Æx sponsas*, ♀) from North America; two Rosy-billed Ducks (*Metopiana peposaca*, ♂) from South America; a Japanese Teal (*Querquedula formosa*, ♀) from North-east Asia; five Chiloe Widgeon (*Mareca sibilatrix*, 3 ♂, 2 ♀) from Chili, a Spur-winged Goose (*Plectropterus gambensis*, ♂) from West Africa, purchased.

OUR ASTRONOMICAL COLUMN.

COUDÉ MOUNTINGS FOR REFLECTING TELESCOPES.—For spectroscopic work the reflector is, without doubt, the most ideal form of telescope. Not only does the visual light-grasping power increase very rapidly the larger the aperture, but for the purposes of photography the same is also true. The refractor has, however, as yet the most convenient and comfortable arrangement for observation from the observer's point of view, while with the reflector the observer is not so conveniently situated. That some kind of coudé arrangement can be adopted is, therefore, an important step in bringing these instruments more into use; for not only are reflectors cheap when compared with objectives, but their mountings and the accompanying housing are much less expensive. Prof. Wadsworth, in the February number of the *Astrophysical Journal* (vol. v. No. 2), describes several ways in which the reflector may be coudé mounted, one of which was suggested by the late Mr. Cowper Ranyard, but was not completely worked out owing to his sudden death. Perhaps the two most promising arrangements are (1) when the reflector is of the Newtonian type, and the primary flat is placed at right angles to the axis of the tube reflecting the cone of rays back again on to two small mirrors, one placed just in front of the mirror, and the other in the polar axis; and (2) when the reflector is of the Cassegrain type, and a single small additional mirror is necessary to reflect the rays directly down the polar axis. The latter appears, however, the more simple of the two, but the method of mounting seems somewhat too weak for mirrors of large size. Prof. Hale, in the same number of that journal, discusses the comparative value of refracting and reflecting telescopes for astrophysical investigations, pointing out the superiority of the latter from many points of view, while Mr. Ritchey describes a new method of a support system for large specula.

ON APPARENT AND REAL DISELECTRIFICATION OF SOLID DIELECTRICS PRODUCED BY RÖNTGEN RAYS AND BY FLAME.[1]

THE fact that air is made conductive by flame, by ultraviolet light, by Röntgen rays, and by the presence of bodies at a white heat has been shown experimentally by many experiments. We propose in this communication to give some results bearing on this conductivity of air, based chiefly on experiments of our own.

We have examined more particularly the behaviour of paraffin and of glass.

In our first experiments with paraffin we used a brass ball of about an inch diameter, connected to the insulated terminal of an electrometer by a thin copper wire soldered to the ball. The ball and the wire were both coated to the depth of about one-eighth of an inch with paraffin. The ball was then laid on a block of paraffin in a lead box with an aluminium window, both of which were in metallic connection with the case of the electrometer. By this means we avoided all inductive effects.

The electrometer was so arranged as to read 140 scale divisions per volt.

After testing the insulation the paraffined ball was charged positively and the rays played on it. After two minutes the electrometer reading was steady at 0·5 of the initial reading. The electrometer was then discharged by metallic connection, and again charged positively. Its reading remained steady after three minntes at 0·63 of the initial charge. In the third and fourth experiments the readings after three minutes were ·81 and ·90 of the initial charges respectively.

The ball was next charged negatively. When the rays were played on it a steady reading was obtained after four minutes at ·18 of the initial charge. In the second, third, and fourth experiments the steady readings after four minutes were ·45, ·70, and ·78 of the initial charges respectively.

The paraffin was then removed and the brass ball polished with emery paper; whether the charge was positive or negative, it fell in about five seconds to one definite position, 50 scale divisions on the positive side of the metallic zero, when the Röntgen rays were played on the charged ball.

These experimental results demonstrate that the Röntgen rays *did not produce sensible conductance* between the brass ball, when it was coated with paraffin, and the surrounding metal sheath: and that *they did produce it* when there was only air and no paraffin between them. From experiments by J. J. Thomson, Righi, Minchin, Benoist and Hurmuzescu, Borgmann and Gerchun, and Röntgen,[2] we know that air is rendered temporarily conductive by Röntgen rays, and Röntgen's comparison of the effect of the rays with that of a flame shows that our experimental results are explained by the augmentation of the electrostatic capacity (quasi-condenser) of the brass ball by the outside surface of its coat of paraffin being put into conductive communication with the surrounding lead sheath and the connected metals.

In our second experiments we have endeavoured to eliminate the influence of the varying capacity of this quasi-condenser. For this purpose, we placed a strip of metal connected to the insulated terminal of the electrometer inside an aluminium cylinder; the space between the metal and the cylinder was first filled with air, afterwards with paraffin. The aluminium was connected to the case of the electrometer, and inductive disturbances were avoided by surrounding the copper wire connecting the metal to the isulated terminal with a lead sheath in metallic connection with the electrometer sheath (see diagram).

In our first experiments with this apparatus we had air, instead of the main mass of paraffin, separating the insulated metal from the surrounding aluminium tube, as shown in the diagram, and we had only small discs of paraffin serving as insulating supports for the ends of the metal, and not played on by the Röntgen rays. When the metal thus supported was charged, whether positively or negatively, the Röntgen rays

---

[1] By Lord Kelvin, Dr. M. Smoluchowski de Smolan, and Dr. J. Carruthers Beattie. Read before the Royal Society of Edinburgh, February 15, 1897.

[2] J. J. Thomson, *Proceedings* R.S.L., February 13, 1896; Righi, *Comptes Rendus*, February 17, 1896; Benoist and Hurmuzescu, *Comptes Rendus*, February 3, March 17, April 27, 1896; Borgmann and Gerchun, *Electrician*, February 14, 1896; Röntgen, Würzburger, Phys. Med. Gesellschaft, March 9, 1896; Minchin, *The Electrician*, March 27, 1896.